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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,915	05/30/2006	Tsutomu Igaki	2006_0700A	8818

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EXAMINER	
SUMMONS, BARBARA	

ART UNIT	PAPER NUMBER
2817	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/580,915	IGAKI ET AL.	
	Examiner	Art Unit	
	BARBARA SUMMONS	2817	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/30/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bauer et al. U.S. 6,420,946 (cited by Applicants) in view of Penunuri et al. U.S. 5,638,036.

Regarding claims 1 and 3, Bauer discloses that it would have been known to form a surface acoustic wave (SAW) single port resonator (see col. 4, lines 20-27) that would have been extremely well known by one of ordinary skill in the SAW resonator art to comprise: an interdigital transducer (IDT) formed of a plurality of electrode fingers disposed on a piezoelectric substrate (see e.g. col. 3, lines 48-51), and reflectors disposed near opposite ends of the IDT; wherein the IDT has a gradation region (called

a junction region by Bauer) where an electrode finger pitch of the plurality of electrode fingers at the opposite ends of the IDT is different from (i.e. smaller than) an electrode finger pitch near a center of the IDT (see Fig 4b) where it is a constant value (see col. 5, lines 28-43); and wherein the electrode finger pitches are sequentially varied to gradually approach the electrode finger pitch near the center of the IDT, in the range from the electrode finger at the farthest end (i.e. adjacent the reflector) to the electrode finger lying at the other end of the gradation region on the center side of the IDT and the number of electrode fingers in the gradation region is discloses as 5 to 8 fingers (see col. 3, lines 8-11). In summary, Bauer discloses a gradation region of 5 to 8 fingers between two structures including an IDT and the reflectors (ibid.) on each side thereof, when the IDT and reflectors have a different constant finger pitch (i.e. ½ period), to form a smooth transition between the IDT and reflector finger pitches (see also col. 5, lines 28-43) and reduce loss caused by the discontinuity (see col. 3, line 58 to col. 4, line 5).

Regarding claim 2 the number of fingers in the gradation region is set depending on the value of the pitch at the farthest end, that being the lowest pitch that the gradation region has to go down to before going up again in the reflector to the constant pitch at the center of the reflector, such that the number of fingers in the gradation region is set based on the discontinuity between the pitch of the IDT and the pitch of the reflector (see col. 4, lines 6-8). Note also regarding claim 3, that the gradation region includes the electrode fingers at both "opposite ends" of the IDT (see claim 1, lines 8-10) such that even if only 3 or 4 fingers are used at each opposite end of the IDT that still leaves 6-8 fingers in the total gradation region including the fingers at both ends.

Regarding claims 4 and 5, Bauer discloses using its resonator in a resonator filter where it is connected "in series and/or in parallel resonator" (see col. 7, lines 11-19), thereby forming the well known filter topology of a ladder filter.

However, Bauer does not explicitly disclose that the pitch at the farthest end of the gradation region and at the end of the IDT (i.e. adjacent the reflector), is set to be 1 through 5% smaller than the constant pitch in the center of the IDT.

It should be noted that Bauer does disclose that the pitch at the end of the IDT should be smaller than the pitches of both the IDT and the reflector (see e.g. col. 3, lines 61-63 and col. 5, lines 31-34) and discloses that the continuous change in finger pitch/spacing in the gradation region does not "differ too severely" (see col. 5, lines 59-62).

Penunuri discloses a simple ladder filter wherein in both the series and parallel resonators the pitch being ½ the period (see Fig. 1) of the IDT differs from that of the reflector (see col. 5, lines 60-64 and the Table I "Second" series and shunt resonators). In, for example, the shunt resonator with a IDT period of 4.8 = pitch of 2.4 microns and a reflector pitch = 2.385 microns, with a drop of 5% the pitch at the end of the IDT would be 2.28 microns which is below both the constant center pitch of the IDT and of the reflector as required by Bauer. That is, one could easily in view of the teaching of Bauer, provide a gradation region at each end of the IDT with the pitch going from the center IDT pitch of 2.4 down to 2.28 and then back up in a gradation region of the reflector to the pitch 2.385 of the center of the reflector. For example, the shunt resonator could use four fingers at each opposite end of the IDT for a gradation region

with 8 total fingers, where the pitch changes continuously from 2.4 to 2.37, 2.34, 2.31, 2.28. For the series resonator the drop could certainly be less than 5% since the IDT already has a pitch less than that of the reflector, so it would be the reflector pitch that would need to be lowered more in the reflector gradation region.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have either modified the ladder filter of Bauer (col. 7, lines 11-19) with resonators having a gradation region at opposite ends of the IDT to make a smooth transition between the pitch of the IDT and that of the reflectors with the lowest pitch at the end of the IDT being 1 to 5% smaller than in the center, or to have modified the ladder filter of Penunuri so that the IDTs would have such a gradation region, because Bauer is silent as to the amount of drop between the center and the edge of the gradation region but explicitly suggests that the spaces between fingers not "differ too severely" from normal which one of ordinary skill would have known included a not severe 1 to 5% drop, or because providing the Penunuri resonators with such a gradation region would have provided the benefit of reduced loss due to the hard transition between the different IDT and reflector pitches as suggested by Bauer (see e.g. col. 5, lines 51-57) and wherein a 1-5% drop, as noted in the example worked through by the Examiner above, would have been obvious in view of Bauer's suggestion that the transition spacing not be changed "too severely" (col. 5, lines 59-62), and wherein the different pitches between the IDTs and the reflectors in both the series and parallel resonators would have provided the benefits of increased bandwidth and lowered insertion loss as explicitly suggested by Penunuri (col. 6, lines 20-26).

3. Claims 6 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Bauer et al. U.S. 6,420,946 (cited by Applicants) in view of Plesski et al. U.S. 5,682,126 and Bauer et al. WO 03/081773.

Bauer US '946 discloses the use of a gradation region as discussed above.

However, Bauer US '946 does not disclose one IDT of a series resonator and one IDT of a parallel resonator being disposed closely in a SAW propagation path and each having the gradation region.

Plesski discloses an arrangement of such acoustically coupled series and parallel IDTs (see e.g. Fig. 3B) that have different finger pitches and is cited because it gives a specific example of values of p1 and p2 of 2.4 and 2.52 microns, wherein it would be a simple matter to provide a 1-5% drop with 3-5 fingers at each opposite end of the IDT 204 e.g. in Fig. 3B for 6-10 fingers in the gradation region or at the ends of IDT 202 in Fig. 3A, since a 5% drop of 2.52 would be 2.395 which is below the pitch of both the series and parallel IDTs as required by Bauer, and the series resonator pitch would drop even less than 5% since it is already the lower of the two.

Regarding the Bauer WO document, the Examiner has also provided U.S. 7,304,553 as an English language equivalent document, and it will be pointed to in the discussion. Bauer WO discloses SAW filters with acoustically coupled IDTs of both series and parallel resonators in the same acoustic track (see e.g. col. 3, lines 24-26 of the US equivalent and Figs. 7 and 8), and discloses using the gradation regions of the Bauer US '946 document in the IDTs (see col. 7, lines 33-40 and claim 15).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified either one of the acoustically coupled series and parallel IDT filters of Bauer WO (Figs. 7 or 8) or Plesski (Figs. 3A and B) to include a gradation region in the IDTs of the series and parallel resonators with the outermost finger pitch being 1 to 5% smaller than the pitch at the center of the respective IDT, because Bauer WO explicitly suggests using the gradation region (see col. 7, lines 33-40 and claim 15), and because Bauer US '946 explicitly suggests that the spacing change not be made "too severely" (col. 5, lines 59-62) which one of ordinary skill would have known includes 1-5% changes, and because Plesski gives a workable example wherein it would have been a simple matter for one of ordinary skill to form the transition as taught by Bauer US '946 with the appropriate number of fingers and a 1-5% drop in pitch between the two pitches of 2.4 and 2.52 microns. Furthermore, the modification of either one of Bauer WO or Plesski to include the gradation regions would have provided the benefits of reduced losses due to the discontinuity between the two acoustically coupled series and parallel IDTs with different pitches as suggested by Bauer US '946 (col. 5, lines 51-57).

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bauer et al. U.S. 7,304,553 is cited as an English translation of the equivalent WO document applied above.

Ebata U.S. 4,635,009 is an English language equivalent of JP 61-142811 cited by Applicants.

Takagi et al. JP 10-335966 discloses a SAW resonator with a pitch that gradually changes with position X (see Fig. 1) between the pitch at the center PTc and the pitch at the ends PTs of the IDT (see the abstract, the last sentence thereof).

Fleischmann DE 41 26 355 discloses a continuously changing pitch between the reflector edge region and the IDT in a SAW resonator (see the abstract) to reduce losses similarly to Bauer US '496 applied above.

Takagi et al. U.S. 6,946,932 discloses a pitch in a center of an IDT PTc being different from the pitch at the sides PTs by within 2% (see the abstract, lines 12-14) but the pitches do not vary continuously so are not "sequentially varied".

Bauer et al. U.S. 7,042,132 and DE 101 11 959 disclose a SAW ladder filter (see Fig. 1 and 2) wherein the resonator IDTs have a pitch with a continuous variation that can go up to a maximum in the center of the IDT (see e.g. Fig. 5), but does not disclose that Pmin is 1-5% smaller than Pmax. Bauer also discloses that it would have been known to use optimization software to provide the required pitch variation (see col. 6, lines 7-11).

Nishimura et al. U.S. 7,501,917 appears to be a related case and discloses acoustically coupled series and parallel resonator IDTs (see Figs. 1, 5, 6 and 19) with gradation regions 2026 and 2036 (see Fig. 7) where the IDTs with different finger pitches are adjacent and gives an example of the pitches at the ends of the gradation region vs. in the center of the IDTs (see col. 8, lines 20-36).

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BARBARA SUMMONS whose telephone number is (571)272-1771. The examiner can normally be reached on M-Thu, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 272-1769. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

bs
May 13, 2009

/Barbara Summons/
Primary Examiner, Art Unit 2817